19990504.ba v02_n532.bam.990504

>From ???@??? Wed May 05 00:56:02 1999
Message-Id: <199905041959.OAA19801@sco.theporch.com>
Date: Tue, 4 May 1999 14:58:58 CDT
From: Old Tube Radios <boatanchors@theporch.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BOATANCHORS digest 2532

BOATANCHORS Digest 2532

Topics covered in this issue include:

1) OTL audio amps
   by "Steve" <scb@loki.internettport.net>
2) Re: Copyright advice needed!
   by "Frank Townsend" <ftownsen@iamdigex.net>
3) Ranger POT needed
   by "Wayne & Deb Harrah" <harrah@ia.net>
4) Re: Ranger POT needed
   by Ray Vasek <w2ec@ibm.net>
5) Re: Copyright advice needed!
   by "Mike O'Brien" <mobrien@lib.drury.edu>
6) WTB: TA-12 C xmtr manual
   by Paul Thekan <Paul.Thekan@eimac.cpii.com>
7) Re: Relays
   by Bob Roehrig <broehrig@admin.aurora.edu>
8) NC-300 and NC-303 paint schemes
   by Nick England <nick@cs.unc.edu>
9) Re: Relays
   by Richard Loken <richardlo@devax.admin.athabascau.ca>
10) Re: Audiophoolery Explained (long)
   by "Robert P. Okas" <vintage@best.com>
11) FS Yaesu AM Filter
   by "Thomas Lemar" <twl@nccoast.net>
12) Re: Audiophoolery Explained (long)
   by "Roberta J. Barmore" <rbarmore@indy.net>
13) Re: Audiophoolery Explained (long) (fwd)
   by "Roberta J. Barmore" <rbarmore@indy.net>

Message-Id: <199905040531.AAA08762@loki.internettport.net>
From: "Steve" <scb@loki.internettport.net>
To: Old Tube Radios <boatanchors@theporch.com>
Date: Tue, 4 May 1999 00:08:20 +0000
MIME-Version: 1.0
Content-type: text/plain; charset=US-ASCII
Content-transfer-encoding: 7BIT

Subject: OTL audio amps
CC: "Old Tube Radios" <boatanchors@theporch.com>

John B.:
>"Interesting thread here; as I remember back, when I first started work at Tektronix, everyone was building a push pull audio amplifier with 6080's. They used them to drive the low impedance load cathode follower style. As I recall, there were something like 6 total tubes"

Greetings, John & Group;

(Standard disclaimer; If memory serves---,)
Perhaps the ultimate OTL amp was the fully D.C. coupled 160W (into 8^) Counterpoint SA-4 monoblock, produced in the early '80s when good sweep tubes were plentiful. Using 10 6LF6s (Two stacked quartets & two screen regs) per amp, each D.C. coupled tube stage had it's own independent regulated power supply. S/S servo handled global DC stabilization. I did get to spend some time with them in a good system. There is probably a writeup on them somewhere on the web.

Regards; Steve

Message-ID: <006f01be95d7$342379c0$df1bfea9@study>
From: "Frank Townsend" <ftownsen@iamdigex.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Copyright advice needed!
Date: Mon, 3 May 1999 22:38:22 -0400
MIME-Version: 1.0
Content-Type: text/plain;
    charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

Dr Ornitz:

Let me correct and amplify this a little.

Bobbi asked about the copyright status of a work published in 1934. For works such as this published between 1923 and 1963, the original copyright term would have been 28 years.

At the end of the 28 year period, the copyright could be renewed for a second term of 47 years. If the copyright were never renewed, the "5 Meter Radiotelephony" pamphlet would have passed into the public domain in 1962, and could be reproduced freely and distributed by anyone without the need for permission or any legal risk. Therefore, Bobbi Barmore quite rightly asked how the renewal status of such a work could be ascertained. The answer is that any individual may search the records of the Copyright Office themselves on site in Washington, DC, or may request searches by Copyright Office staff for $20/hour.

If the 1934 copy *had* been renewed in 1962, the 47 year renewal term would have been increased to 67 years for a total term of 95 years beginning in 1934. The 20 year extension results from the Sonny Bono Copyright Term Extensio Act, passed in late 1998 after intense lobbying by the entertainment industry including Disney whose copyrights on Micky Mouse and other properties were due to expire in the next several years.

The trouble with copyright law is that since the 1909 Copyright Act, there have been several laws enacted affecting the copyright of works published between 1923 and 1962.

Currently, the copyright term is life of the author plus 70 years, or for works of corporate authorship, the shorter of 95 years from publication, or 120 years from the date of creation.

Frank Townsend
Baltimore, Maryland

-----Original Message-----
From: Barry L. Ornitz <ornitz@tricon.net>
To: Old Tube Radios <boatanchors@theporch.com>
Date: Monday, May 03, 1999 11:00 PM
Subject: Re: Copyright advice needed!

>Roberta Barmore asked about copyrights, wanting to print some copies of "5
>Meter Radiotelephony".
>
>The current copyright period is 75 years from the last copyright
>publication. So I think you cannot republish without permission in this
>case.

Message-ID: <035c01be9626$ba0a1860$5eeee6ce@default>
From: "Wayne & Deb Harrah" <harrah@ia.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Ranger POT needed
Date: Tue, 4 May 1999 07:07:23 -0500
MIME-Version: 1.0
Content-Type: text/plain;
     charset="Windows-1252"

Content-Transfer-Encoding: 7bit

Anybody know where to get the 4Watt (or bigger) 25K, linear taper, WIREWOUND pot that is used in the drive control on the RANGER? I checked about 9 catalogs and only found one in one, but they want $40 for it (Newark). Everybody else either has the wrong value or the wattage isn't big enough (usually they are 2watts max). (Mine seems to have DROPPED to 17K max resistance, which isn't enough.)

I usually try not to let price keep me from doing "the right thing" in parts replacement, but SHEESH! I've tried the following catalogs with no luck:

[] Newark (well, ungodly expensive, but they have one)
[] Farnell
[] Allied
[] Antique Elect. Supply
[] Local Professional parts retailer (NOT RAT SHARK)
[] RFParts.com
[] Digikey
[] Tech America
[] Parts Express

Anybody got a good one they will sell me? I hate to think about trying to cobble resisters in-line or something to take up the slack.

Thanks a bunch!

Buzz (Wayne) Harrah, ke0ms
http://www.ia.net/~harrah
mailto:harrah@ia.net (home)
mailto:Wayne.Harrah@mci.com (work)

Message-ID: <372EE7C9.763C1487@ibm.net>
Date: Tue, 04 May 1999 08:27:53 -0400
From: Ray Vasek <w2ec@ibm.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
CC: List-BA <Boatanchors@theporch.com>
Subject: Re: Ranger POT needed
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Fair Radio had some 25watt 20K w/w rheostats in their last mini-catalog. No idea what the form factor is, but for $1.50 it wouldn't hurt to try one out. Part number is RHEO-25W (20K). I don't recall what the schematic shows for the Ranger/Valiant drive control hookup so not sure if a rheostat will work as is or if it might take some re-engineering of the rheostat, but with a little

creativity it might be just the thing for all those Rangers and Valiants needing
a replacement drive pot.

73, Ray W2EC

> Anybody know where to get the 4Watt (or bigger) 25K, linear taper, WIREWOUND
> pot that is used in the drive control on the RANGER? I checked about 9

Message-Id: <3.0.6.32.19990504085447.007a75e0@lib.drury.edu>
Date: Tue, 04 May 1999 08:54:47 -0500
To: Old Tube Radios <boatanchors@theporch.com>
From: "Mike O'Brien" <mobrien@lib.drury.edu>
Subject: Re: Copyright advice needed!
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

I don't claim to be an expert on copyright law, but it is my understanding
that revisions effective last October add 20 years to the former terms of
copyrights. Thus, in Bobbi's case, the term is 95 years from publication
(although it seems likely that the current holder, if one exists, wouldn't
object to a modest reprint of such a quaint booklet). By the way, the new
legislation was introduced by the late Rep. Sonny Bono at the behest of one
of his influential constituents, Disney, in order to prolong profits on
early cartoon characters....

     Mike, K0MYW

At 10:59 PM 5/3/99 -0400, you wrote:
>Roberta Barmore asked about copyrights, wanting to print some copies of "5
>Meter Radiotelephony".
>
>The current copyright period is 75 years from the last copyright
>publication. So I think you cannot republish without permission in this
>case. You can check with the Copyright Office (part of the Library of
>Congress) to research any records. They have an excellent web presence
>with many helpful articles and guides available to download.
>
>Getting permission to publish is sometimes simple, and nearly impossible at
>other times - especially if the author is deceased.
>
>   73, Barry L. Ornitz   WA4VZQ   ornitz@tricon.net
>
>

Message-Id: <199905041328.GAA07705@scottie.eimac.cpii.com>
Date: Tue, 04 May 1999 07:23:51 -0700

To: Old Tube Radios <boatanchors@theporch.com>
From: Paul Thekan <Paul.Thekan@eimac.cpii.com>
Subject: WTB: TA-12 C xmtr manual
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

I would like to find a manual for this Navy Bendix xmtr. Any leads on one are appreciated.

Thankyou
Paul N6FEG

Date: Tue, 4 May 1999 09:26:37 -0500 (CDT)
From: Bob Roehrig <broehrig@admin.aurora.edu>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Relays
Message-ID: <Pine.ULT.3.96.990504092525.4750A-100000@admin.aurora.edu>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

On Mon, 3 May 1999, Jerry Proc wrote:

> After hunting through my junkbox trying to build an electrically
> equivalent replacement relay, I noticed that quite a few relay coils
> are stamped with the value of resistance. To me, the voltage, current
> rating and power type would be a more useful parameter. Why the value
> in ohms?

Well, it gives you a rough idea of how they were intended to be used. For example, if it says 5K you can pretty well bet it is intended to be used in a plate circuit. If it says 120 ohms, then it is meant to run from maybe 6 or 12V.

"Nostalgia is a thing of the past"
E-mail: broehrig@admin.aurora.edu or k9eui@arrl.net 73 de Bob, K9EUI
CIS: Data / Telecom Aurora University, Aurora, IL
630-844-4898 Fax 630-844-4222

Date: Tue, 4 May 1999 11:03:05 -0400 (EDT)
From: Nick England <nick@cs.unc.edu>
Message-Id: <199905041503.LAA11023@altair.cs.unc.edu>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: NC-300 and NC-303 paint schemes

I have been exchanging e-mail with several people lately about NC-300 and NC-303 paint schemes. I will try to take some photos this week and get them on the web showing the following:

NC-300 (front, back, sides)
NC-303 (front, back, sides)
NC-300TS smooth - speaker for NC-300 (early)
NC-300TS wrinkle - speaker for NC-300 (late)
NTS-2 - speaker for NC-303, NC-400
NTS-1 - speaker for NC-109, NC-188

Hope that will help.
73 & Have Fun,
Nick England KD4CPL   nick@cs.unc.edu   Univ. Of North Carolina
http://www.cs.unc.edu/~nick/hobbies.html   Chapel Hill NC

Date: Tue, 04 May 1999 12:25:23 -0600 (MDT)
From: Richard Loken <richardlo@devax.admin.athabascau.ca>
Subject: Re: Relays
To: Old Tube Radios <boatanchors@theporch.com>
Cc: Old Tube Radios <boatanchors@theporch.com>
Message-id:
 <Pine.PMDF.3.95.990504121831.541065907C-100000@devax.admin.athabascau.ca>
MIME-version: 1.0
Content-type: TEXT/PLAIN; charset=US-ASCII

On Tue, 4 May 1999, Bob Roehrig wrote:
> On Mon, 3 May 1999, Jerry Proc wrote:

> > equivalent replacement relay, I noticed that quite a few relay coils
> > are stamped with the value of resistance. To me, the voltage, current

> Well, it gives you a rough idea of how they were intended to be used.
> For example, if it says 5K you can pretty well bet it is intended to be
> used in a plate circuit. If it says 120 ohms, then it is meant to run from
> maybe 6 or 12V.

That is not all, some relay coils were intended to be in series with something else rather than across the power supply so they tended to have low coil resistance so as to minimize their influence on the rest of the circuit. The phone company liked to do this for things like detecting an off hook condition or a thousand other things we could never imagine.

Go find the paper work for a pre-1970 PABX, you would be amazed at 1) how many pages of drawings there were 2) how many ways there are to make and use a relay and 3) how many things those old PABX's could do by flashing a hook switch. Once a long time ago, I made my living reading those drawings and trying to fix bugs that the subscribers had found (like bypassing the toll restriction with a carefully time hook switch flash ... how do people find out that stuff?).

Richard Loken VE6BSV, Systems Programmer - VMS
Athabasca University
Athabasca, Alberta Canada
** richardlo@admin.athabascau.ca **

Date: Tue, 4 May 1999 11:33:24 -0700 (PDT)
From: "Robert P. Okas" <vintage@best.com>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Audiophoolery Explained (long)
Message-ID: <Pine.BSF.4.10.9905041019520.21563-100000@shell14.ba.best.com>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi gang,

On Mon, 3 May 1999, Barry L. Ornitz wrote:

> Arden wrote:
>
> >You bet there were. That's when TIM (transient intermodulation
> >distortion) was invented.

Gotta throw in my 0.02 to bring up some facts. First, when you scan scholarly literature, you will discover that Dr. Matti Otala is one of the first, if not *the* first to investigate the effects of T.I.M. extensively. It wasn't necessarily 'invented' so much as researched as a source of hyellowy audio. One has to assume that since these were scholarly works, his purpose was to explain why solid state amps sounded so lousy.

Barry Ornitz posited:
>
> Actually the propagation delays in the transistors were not the major cause
> of this. It was how the feedback was applied.

<< Snip for brevity >>

I partially agree on these two points. The transit time in semis plus the enormous amounts of feedback employed were the real culprits. Mor on this later.

>
> Basically what happens is that any signal applied to the first stage has to
> pass through several succeeding stages before the resulting output signal
> is sent back to the first stage as feedback. There is a natural phase
> shift (related to, but not exactly the same as time delay) through each
> stage. By the time the signal reaches the output stage, the phase shift
> might be considerable. When this signal is fed back to cancel distortion,
> it is no longer in the necessary phase relationship to do the best job.
> The idea of calling the distortion, "transient distortion", is because for
> a fast transient, it must pass through several stages before the feedback
> can even be applied to try to cancel it. By this time, the transient may
> have disappeared. Propagation delays in transistors can make this worse,
> but their effect is small at audio frequencies - just like the transit time
> of electron tubes.
>
> The Hi-Fi Audiophool industry seemed to think they had invented something
> new. They just did not understand feedback theory. Vacuum tube amplifiers
> rarely had this problem since either no feedback was used, or it was
> applied around only single stages (like degenerative feedback from a
> cathode resistor). It is extremely rare to see a feedback design published
> for a vacuum tube amplifier where the loop extends beyond two stages.
> Because the transistors were so nonlinear, heavy feedback had to have been
> used. Placing it around several stages cut costs, and the steady state
> distortion was superb. But they forgot about the fact that music is not a
> collection of steady-state sinewaves.
>

I need to review some facts here. In a typical medium power tube amp, say the Dynaco ST-70, you have a voltage amp of some sort, in this case, the pentode half of a 7199. Next up is the phase inverter of the split-load type using the triode half of the 7199. Next up is the push-pull stage followed by the output tranny. Take the feedback from the tap where the speakers are connected, run through an RC network and on to the cathode of the first 7199 stage. That's 3 stages encompassed by the loop. In an RCA tube manual I have, there's a design that incorporates a driver stage to the basic topology just described. So now we're up to 4. Feedback loops around 3 or more stages in tube amps are quite common.

Each gain stage also has some local degenerative feedback to adjust the gain and distortion characteristics of that stage. If you forget to connect that little feedback wire to the appropriate speaker tap, the amp won't blow up in your face since the open-loop gain is limited by design. But, it won't sound the greatest either. Overall negative feedback in hollow state amps was used primarily to get the speaker circuit involved (and therefore decrease the output resistance) so that its contribution to distortion, as well as the output tranny's can be compensated.

On the other hand, sand state designers embraced the op-amp model for

2nd and 3rd generation power amp designs. That, IMO, is where the trouble started. Without feedback, the open-loop gains of these designs could be in excess of 500,000. This was way too much, but was easily knocked back with a simple feedback network. A major bonus was lower steady-state harmonic and intermod distortion. Most folks on this list are old enough to remember the distortion wars fought by the (mostly) off-shore hifi purveyors, who claimed an aveage joe or jane could tell the difference between .01% and .001%. If anything, the industry knew all too well about how to apply feedback to hit the steady-state distortion bogie set by the marketing depts. The problem is that these amps are not used to amplify steady-state stuff. Amplifying dynamic signals causes these to sound horrible. That's where T.I.M. comes into play, induced by the excessive overall feedback and the transit times in sand state devices. The loop 'breaks' during those transients and the whole thing goes into saturation.

Since little bits of doped sand were cheaper to use than a hollow state device and ran cooler, why not throw a bunch of them into a diff-amp, high voltage gain stage and complementary-symmetry OTL stage design? Can't do that easily and cheaply with toobs. That's why the latter used more reasonable amounts of overall gain, because it was not practical nor desirable to build toob op amps for audio.

> The same audio industry has also tried to blame electrolytic capacitors for
> distortion (ala Walt Jung). The funny thing is, no self-respecting vacuum
> tube engineer would have ever used electrolytic capacitors in a signal path
> unless they absolutely HAD to get that much capacitance, and then only with
> the capacitor heavily biased.

We must remember that tube circuits use inherently higher impedances than sand state. No real need for 'lytics except as bypasses since high capacitance isn't required in the signal path. I remember Jung's papers. Capacitor distortion is a quantity that can be easily measured, it's not pseudo-science hokum.

>
> As Arden and Richard Loken discussed, modern audio amplifiers tend to be
> "perfect" in the reproduction and amplification of the input signal. But
> like many things, our ears tend to play tricks on us. Many prefer "the
> sound of distortion". The study of this subjective process is known as
> psychoacoustics.

I know a fellow whom I respect both for his solid technical background as well has his knowledge and appreciation for the finer things in audio. Even he admits that solid state beats toobs in his setup. But he prefers toobs for amplifying certain program material because of the coloration it offers.

<< More snipping >>

>
> 73, Barry L. Ornitz WA4VZQ ornitz@tricon.net
>

73,
Bob - W3CD

Message-ID: <015801be9661$8a017ce0$9e0ef4d0@0669u>
From: "Thomas Lemar" <twl@nccoast.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: FS Yaesu AM Filter
Date: Tue, 4 May 1999 15:08:47 -0400
MIME-Version: 1.0
Content-Type: text/plain;
charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

Hello
I found a Yaesu AM Filter in some boxes I have and I called Yaesu this afternoon to see what radio it was made for.
It is a XF-31B Am filter and they said it was for the FT-101 and would work in all the 101 series radios.
If anyone is interested in it, I will take $25.00 for it plus shipping from 28462

Thanks
Tom

Date: Tue, 4 May 1999 14:13:53 -0500 (EST)
From: "Roberta J. Barmore" <rbarmore@indy.net>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Audiophoolery Explained (long)
Message-ID: <Pine.SUN.3.96.990504134928.19480A-100000@indy1>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi, Gang!

Interesting coincidence--Pat Hawker's "Technical Topics" column in the latest RadCom has a segment on SS vs. tube amps, mostly a letter from a fellow who designed one of the earlier MOSFET designs (MOSFETs would sort of *like* to be tubes--with the very high input Z of the devices, you're in a more "tube-like" world, at least). He points out that early bipolar designs tened to be Class B, with more crossover distortion than comparable tube designs, and that the slew rate of the devices themselves wasn't all that great (and negative feedback only makes it worse; this is a slnatways apprach to the discussion of TIM--also sometimes known as "slew-induced distortion"--earlier in this thread).

Both effects produce what we might call non-musical distortion. Any musical instrument produces some kind of waveform we can figger out a Fourier series for: some kinda fundamental sinewave, plus various others laid atop it to create the sound. And it turns out that some collections of fundamental and--oh, to be sloppy, we'll call 'em overtones and brave the ire of those who use the word precisely--anyway, some of these collections of waves are more pleasing to the human ear than others. Turns out we like triangle waves better than square waves, which means (go draw it out if you doubt!) we like even harmonics better than odd harmonics; and we're not at all fond of overtones *unrelated* to the fundamental. (And from this we get such new ways of looking at awfulness as "intermodulation distortion" [IMD], TIM and so on).

What does this mean? It means there are degrees of sin in amplifier design! *If* the flaws in your pet amp happen to produce "musical" distortion, you might prefer it to one that has less but "non-musical" distortion! Depends: 0.1% "generic distortion" will not always beat 0.01%, but 0.1% usually beats 15%. (The wickedness even varies with application--an amp that a skilled electric guitarist finds very good indeed indeed will likely stink on ice when you play your Montovani records though it!)

...And the other thing all this means is implicit in the parenthetical assertion above: we can *generalize* about human response to complex sound but in the final analysis, it is subjective and individualistic. Some people like Slim Witman, others prefer Jimi Hendrix; or bagpipers, or Ravi Shankar, or whatever; and we all have differeing tolerances and expectations for what recorded music should "sound like" when played back. (And just to make matters worse, humans are *really* badly equipped to remember and compare subtle nuances of sound, even the folks with perfect pitch! 'Swhy we have to write down music, and use test gear to check frequency response and distortion).

On another thread, tubes can be made to sound quite bad indeed though misapplied negative feedback. Older AM BC transmitters, especially the high-powered ones, tended to suffer a muddy, plodding sound (long before NRSC II whacked the freq response of AM

```
`x`x`x~`x~`x~`x~`x~`x~x~~~```x`x`x~`x~`x~`x~`x~`x~x~x~~~```x`x`x~`x~`x~`x~`x~`x~x~
~~``x`x`x~`x~`x~`x~`x~`x~x~x~~~```x`x`x~`x~`x~`x~`x~`x~x~x~~``x`x`x~`x~`x~`x~`x~`x
~x~x~~~```x`x`x~`x~`x~`x~`x~`x~x~x~~
```

KB9GKX "RJ" rbarmore@indy.net   Roberta J. (Bobbi) Barmore
FISTS #3388 * G-QRP #10001 * ARRL * RSGB * WIA
Appreciator Of Vacuum-Tube Ham Gear and Vintage Keys

Date: Tue, 4 May 1999 14:59:58 -0500 (EST)
From: "Roberta J. Barmore" <rbarmore@indy.net>
To: Old Tube Radios <boatanchors@theporch.com>
cc: vintage@best.com
Subject: Re: Audiophoolery Explained (long) (fwd)
Message-ID: <Pine.SUN.3.96.990504141656.22028B-100000@indy1>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

My apologies--a burst of line noise crashed and then *sent!* this message while in composition.

Hi, Gang!

Interesting coincidence--Pat Hawker's "Technical Topics" column in the latest RadCom has a segment on SS vs. tube amps, mostly a letter from a fellow who designed one of the earlier MOSFET designs (MOSFETs would sort of *like* to be tubes--with the very high input Z of the devices, you're in a more "tube-like" world, at least). He points out that early bipolar designs tened to be Class B, with more crossover distortion than comparable tube designs, and that the slew rate of the devices themselves wasn't all that great (and negative feedback only makes it worse; this is a slnatways apprach to the discussion of TIM--also sometimes known as "slew-induced distortion"--earlier in this thread).

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...And the other thing all this means is implicit in the parenthetical assertion above: we can *generalize* about human response to complex sound but in the final analysis, it is subjective and individualistic. Some people like Slim Witman, others prefer Jimi Hendrix; or bagpipers, or Ravi Shankar, or whatever; and we all have differeing tolerances and expectations for what recorded music should "sound like" when played back. (And just to make matters worse, humans are *really* badly equipped to remember and compare subtle nuances of sound, even the folks with perfect pitch! 'Swhy we have to write down music, and have to use test gear to check frequency response and distortion).

On another thread, tubes can be made to sound quite bad indeed through misapplied negative feedback. Couple of examples:

The late John W. Campbell, best known as editor of a science fiction mag (also a ham and a sharp electronics guy), got into hi-fi early on, and cooked up a nifty R/C-coupled phase splitter for a homebrew amp. It measured *great!* ...And sounded awful; turns out John's phase-splitter was a phase-shift oscillator with very, very little feedback. Stable with no input, but rang like a bell with any input; the effect was to crank up the sine fundamental of any input signal. He named this "sineward distortion," and started checking his amps with a sawtooth wave (fast rise, linear decline: |\). (Not a bad idea--twenty-some years later, it became vogue to push square waves through amps, below the clipping level, and see how square they still were on the way out).

Older AM BC transmitters, especially the high-powered ones, tended to suffer a muddy, plodding sound (long before NRSC II made all AM BC stations sound like mud). The cause was an *immense* feedback loop, wrapped around the *entire* modulator! A humongeous R/C network stretched from a tap on the modulation transformer all the way back to the input stage, and in any rig from 5 kW on up, the large amounts of feedback employed and the many stages in between meant that what arrived to "linearize" the input was phase-scrambled and shifted to a significant degree (pun intended). The truely hip and happenin' Engineering Departments bravely modified their rigs (and made sure the competition was kept in the dark) Everyone else *leapt* upon pulse-duration-modulation AM rigs when they hit the market. While PDM does have inherent advantages over conventional plate-modulation, it wasn't the method so much as the AF amplifier that drove it--the wonky feedback network and many, many stages around which it was wrapped were gone. RCA's "Ampliphase" rigs, which made AM by beating it out--two big transmitters, wabbling in and out of phase, combined to create a normal AM signal--could, when they were working [a small problem...] provide just about as nice a sound as the later PDM lash-ups, and for the same reason.

"Capacitor distortion" is real and measureable, though in so doing you must ensure you haven't made a first-order RC filter between the signal generator and distortion analyzer! Condensers are among the least "ideal" of any component, meaning real ones don't act like their simple theoretical models. Electrolytics don't do well with low polarizing voltage and complex applied waveforms; many ceramic formulations--especially the small-size ones with trick dielectrics to get more C in less space, Z5U, X7R & cousins--are appreciably nonlinear. (In fact, I wonder if a *good* waxed-paper job might not be better at audio frequencies--for a few years!) Monolithic NP0/COG ceramics do *not* use a fancy formulation, just pretty plain ceramic, and they act more like just plain condensers; so do the little polystyrene types and silver-micas. See a pattern? The same kinds of condensers that make for crummy VFO stability exhibit distortion at audio frequencies! And for the same reason--they're not stable and not linear with changes in applied voltage, AC current, temperature, etc. These are basic, easy-to-measure effects; there is no hoodoo or mystical knowledge involved. Don't take me on faith--drag out the AF gen and distortion meter and check 'em! (You will need pretty good gear, I admit; but with careful adjustement, the old H/P 330 analyzer and 650 generator or their SS offspring will do the job).

To conclude:
Bad is bad, and we can usually find bad stuff by measurement and test procedures, if we know to look for it (Bobbi's Rule for Solving Tricky Problems: question your basic assumptions!); it's "good" that proves elusive! The quest of any designer of any electronic device is to find the *least* *bad* means of accomplishing his or her design goals, within the price and "buildability" limitations the application requires. Some of 'em are better at this than others--depends a lot on motivation, awareness of the gotchas, and how much they've got to spend in both time and materials.

Are tubes better than transistors? I dunno--is pizza better than hamburgers? Depends on which one you like best!

73,
--Bobbi

(And how does this apply to BAs? One good notion is to look at a design as the designer saw it: ask yourself what the goal was. It makes understanding the circuitry a *lot* easier! See Hank's postings on the low-end Halli designs [and AA5s] for a good example of this.)

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